LIFE HISTORY NOTES AND A STUDY OF THE EFFECTS OF HUMIDITY ON ADULT EMERGENCE OF RHAGOLETIS SUAVIS CRESS., FROM PUPAE AT A CONSTANT TEMPERATURE (DIPTERA, TRYPETIDÆ)[1]

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In Iowa, the walnut husk maggot, *Rhagoletis suavis* Cresson, infests the black walnut, *Juglans nigra* Linn., and the butternut, *Juglans cinerea* Linn., the most wide-spread infestation occurring in black walnuts. This paper is chiefly concerned with the insect in the black walnut.

During the latter part of September, 1930, several bushels of black walnuts were harvested, which were heavily infested with the husk maggot, the number of maggots ranged from one to thirty-six per nut. The nuts were divided into two lots, one lot being used to determine spring emergence and the other for a study of humidity and constant temperature effects.

Infested walnuts for outdoor study were placed upon the surface of loose humus soil in shallow boxes which were exposed to outdoor conditions throughout the fall and winter months. In the late spring of 1931, cheesecloth emergence cages were constructed and placed over the boxes containing the walnuts. The cages possessed sliding glass fronts which enabled one easily to count and collect the flies as they emerged.

The first fly emerged June 15, but no further emergence took place until July 6, when eight more flies were collected in the cage. Continued emergence of three or four individuals daily occurred during the month of July. A decided increase in the number emerging took place during the first of August and reached its highest point for the entire season on August seventh

[1] Contribution from the Department of Zoology and Entomology, Iowa State College, Ames, Iowa.

[2] The writer wishes to thank Dr. C. H. Richardson for his helpful suggestions in this investigation.

when thirty-eight flies were obtained. The last fly to issue appeared on the sixteenth of August.

The following procedure was followed for the humidity and temperature studies: Wooden boxes two feet square and four inches deep were partially filled with loose soil and a layer of infested walnuts was placed over the surface. The boxes were allowed to stand outdoors for a period of three weeks. Meanwhile great numbers of larvæ emerged from the walnuts and pupated a few inches beneath the surface of the soil. A large basin was provided into which one quarter of the box of soil containing the pupæ could be placed. The specific gravity of the pupæ was less than that of the surrounding soil particles and the pupæ which floated on the water surface were easily removed with a tea strainer. The pupæ were then immediately placed on blotting paper and allowed to dry for a few hours.

Pupæ so collected were placed in a wire screen cylinder over distilled water in a closed chamber, where the relative humidity was maintained at approximately 100 per cent. The chamber was opened daily for a few minutes for aeration.

The wire cylinder which contained the pupæ was removed from the high humidity chamber November 19, 1930. Ten pupæ were placed in each of a number of shell vials 60 mm. high × 12 mm. wide and the vials were then maintained at 2° C. On December 4, four lots of 100 pupæ (10 vials to each lot) were removed and subjected to the following humidities: 32%–70%–81%–100%,[3] at a constant temperature of 30° C.[4] Each humidifier was a medium sized desiccator, the lower portion of which contained the saturated salt solution, while in the upper compartment were placed the shell vials in groups of ten on a wire screen. Each vial was loosely stoppered with cotton.

At intervals of every fifteen days new lots of pupæ were taken

[3] Humidities were determined by use of the table constructed by Hugh M. Spencer in his "Laboratory Methods for Maintaining Constant Humidity." International Critical Tables, Vol. I, pp. 67–68, 1926.

The following were used to maintain the humidities: $MGCl_2 \cdot 2H_2O = 32\%$; $NaCl = 70\%$; $(NH_4)_2SO_4 = 81\%$; $H_2O = 100\%$.

[4] Constant temperature and humidity apparatus for use in the experimental study of insects. T. A. Brindley & C. H. Richardson, Ia. State College, Jour. Sci. V, No. 4, pp. 211–221, 1931.

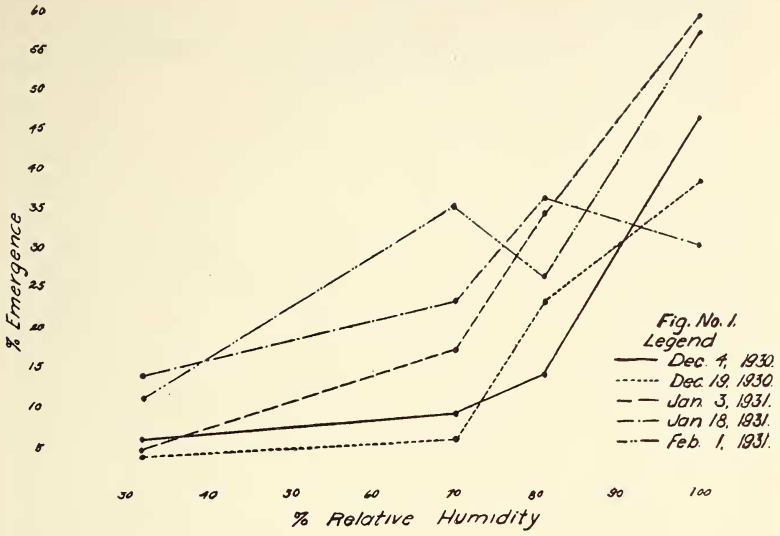
from the low temperature box and subjected to the above tests. The same procedure was continued until February 3, 1931.

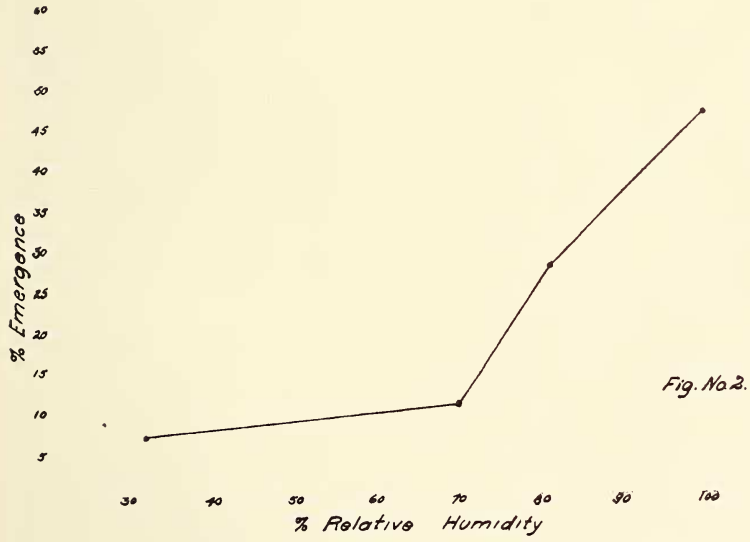
On January 7, 1931, the first fly emerged. On the succeeding days regular emergence took place at the various humidities, continuing until the last of April, when very few flies remained.

Although preliminary, these tests indicate that humidity plays an important rôle in determining the percentage of adult emergence and it may be tentatively said with reference to *R. suavis* that the greater the percentage relative humidity, temperature remaining constant, the greater will be the emergence.

PLATE XXI

Figure (1) shows graphically the per cent. emergence of the various lots (December 4, December 19, January 3, etc.) at the respective humidities. In Figure 2 is shown the mean percentage emergence for the entire group at the different humidities, *i.e.*, the number of flies emerging regardless of the date removed from the low temperature chamber.


% Emergence
% Relative Humidity
Fig. No. 1.
Legend
Dec. 4, 1930.
Dec. 19, 1930.
Jan. 3, 1931.
Jan 18, 1931.
Feb. 1, 1931.


% Emergence
% Relative Humidity
Fig. No 2.